

## Modeling the effect of probe force on length measurements on polymer parts - DTU Orbit (09/11/2017)

### Modeling the effect of probe force on length measurements on polymer parts

Measurement uncertainty at micrometer level is in the future going to be very common in dimensional measurements on polymer parts. Accurate dimensional measurement of polymer parts is becoming a key and common practice in the industry, especially when micrometer tolerances are required. When conducting measurements with a contact probe there is always a force applied to the part. This force (0.3N – 3.3N) leads to deformations that influence the final result. The unknown deformation of the part under the measurement conditions can produce significant errors in the measurement. In the present work, Hertzian contact theory was applied to find the deformation analytically, where the measuring force was imposed to the part. Material properties of the polymer and radius of the probe tip were known parameters. The finite element software ABAQUS was then used to model the contact problem numerically. Both analytical and numerical approaches were compared with the experimental results. The results showed that the numerical model was able to predict the deformation of the polymer part due to different probe forces. Furthermore it was shown, that the probe force should be taken into account when measurement with a few micrometer accuracy should be performed on thin walled polymer parts.

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